Energy, Work and Power

Mark Scheme 6

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	General Physics
Sub-Topic	Energy, Work and Power
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 6

Time Allowed: **76 minutes**

Score: **/63**

Percentage: **/100**

1 **(a** mgh in any form, numbers, words, symbols C1
5.4 J OR 5.297 J OR 5.292 J OR 5.3 J OR 5.29 J A1

(b) ½mv^2 in any form, numbers, words, symbols C1
14.7 (J) C1

(energy given by player =) 9.3 J OR his **(b)** – **(a)** correctly evaluated A1

(c) friction with <u>floor / inside ball</u> OR energy to deform ball OR sound OR idea of hysteresis of rubber
ignore heat / air resistance B1

(ii) 78% OR ratio of PEs
accept (14.7 × 0.78 =) 11.47 (J) OR (0.78 × 0.9 =) 0.702 (m) C1

3.12 m to at least 2 sig figs A1

(iii) idea of (some of) energy <u>lost</u> / <u>becomes</u> / <u>converted</u> / <u>transferred</u> to heat in ball
ignore friction <u>B1</u> [9]

2 **(a (i)** (speed =) distance/time in any form, words, letters, numbers C1
0.15 m/s or 15 cm/s A1
(if answer only, 1 mark for either if no units)

(ii) (PE =) mgh OR mgh OR Wh symbols, words or numbers C1
100 J OR 98.1 J OR 98 J A1

(iii) his **(ii)**/40 OR his **(ii)**/4
2.5 W OR 2.45 W e.c.f. from **(ii)** A1

(b) (input) greater/output less NOT a numerical factor B1

[Total: 7]

3	**(a**	mgh OR 0.15 × 10 × 0.3	C1
		0.45 J	A1
	(b)	idea of max KE at lowest point OR h = 0.1	C1
		idea of PE lost = KE gained	C1
		0.15 × 10 × 0.1 OR 0.15 × 10 × 0.2	C1
		0.15 J c.a.o.	A1
	(ii)	(KE =) $½mv^2$ OR $0.15 = ½ \times 0.15 \times v^2$ e.c.f. OR $gh = ½v^2$ OR $10 \times 0.1 = ½v^2$ e.c.f.	C1
		(v =) 1.4 m/s e.c.f. as long as mass correct	A1
	(iii)	0.3 m	B1
	(iv)	cord straight	B1
		bob at same height as original	M1
		straight cord at approx 30° to vertical, by eye	A1
		[Total: 12]	
4	**(a**	mgh OR 0.5 × 10 × 1.1	C1
		5.5 J	A1
	(b)	1.5 (J)	B1
	(ii)	energy used to deform ball/ground OR strain energy stored in (deformed) ball/ground OR heat generated in deformed ball/ground	B1
	(c)	(initial energy =) 9 + answer to **(a)**, correctly evaluated	C1
		use of $½mv^2$	C1
		7.6 m/s	B1
		[Total: 7]	

5 **(a (i)** $\frac{1}{2}mv^2$ C1
½ × 7500 × 12 × 12 C1
540 000 J OR 540 kJ

(ii) $W = E/t$ in any form B1
10% × his **(a)** C1
54 000 W OR 54 kW e.c.f. A1

(b) **(i)** 3750 kgg

(ii) [If ecf from **(i)** and no other errors, maximum mark is 2]
mass: ½ OR correct sub in $\frac{1}{2}mv^2$ C1
speed: ½ OR 6750 (J) J)
fraction = ⅛ / 0.125 / 1:8 ? 12.5 % (c.a.o.) A1 [10]

6 **(a** (P.E.) = mgh C1
12 × 10 × 3 Accept g = 9 C1
360 J g = 9.8 gives 352.8 J (minimum 2 s.f.) A1
g = 9.81 gives 353.16 J (minimum 2 s.f.)

(b) (P =) E/t C1
360/60 C1
6 W 352.8 J gives 5.88 W 353.16 J gives 5.886 W (minimum 2 s.f. A1

[6]

7	**(a)**	fusion (of nuclei) CARE: NOT fission or fision ACCEPT fussion condone radiation as an extra		B1
	(b)	radiant/heat energy from Sun or radiation from Sun energy from Sun raises temperature of water/heats water/melts ice energy from Sun evaporates water PE in cloud rain stored water has PE	) any 3	B1 × 3
	(c)	**(i)** 25/100 for gas-fired or 30/90 for hydroelectric or energy out/energy in or power out/power in		B1
		(ii) 30/90 or 1/3 or 33% is more than 25/100 or ¼ or 25% OR lower input into hydroelectric station, but more output than gas-fired station IGNORE hydroelectric losses less than gas-fired losses		B1
				[6]

8	**(a)**	mgh or 90 × 10 × 14 accept 9.8 or 9.81 instead of 10	C1
		12 600 J or 12348 J or 12360.6 J nothing else	A1
	(b)	PE lost = KE gained or $mgh = \frac{1}{2}mv^2$	C1
		$(v^2 =)$ 280 e.c.f. or 274.4 or 274.68	C1
		16.7 m/s e.c.f. or 16.565 m/s or 16.573 m/s NOTE: 16.8 m/s gets A0	A1
	(c)	energy lost or friction/air resistance/drag/wind resistance	B1
			[6]